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ABSTRACT

This paper describes a research and development effort by Jostens Learning Corporation that resulted in the Renaissance Information Management System (RIMS), an information-management user interface for an integrated learning system that is designed to overcome two major obstacles to the use of computer systems by classroom teachers--limited access to administrative and instructional information stored on computers, and ease of use. Data on barriers to computer use were collected via surveys conducted in school systems across the United States which included questionnaires from classroom teachers with varying levels of computer involvement, school administrators, parents, and community volunteers. A National Advisory Council made up of expert classroom teachers, administrators, and computer specialists also provided information and guidance. Based on these data, several hundred requirements were defined for the new system. Teachers wanted access to other staff members, outside experts, curriculum information, student records, collaborative learning tools, electronic references, and productivity tools, as well as more control over curriculum delivery and student assessment. Educators also requested a system far more sensitive and adaptive to individual student needs and conditions, i.e., an "intelligent" instructional delivery system. RIMS, which makes extensive use of hypertext, graphically portrays the school environment, providing users with tools that are familiar in appearance and easily allow for the customizing of instructional sequences and the monitoring of student progress. Descriptions of the Student Records and the Learning Path Editor modules include illustrations of sample screens. (BBM)

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Enhancing Teacher Utilization of Complex Instructional Systems

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Introduction

It is acknowledged that nationwide schools are underfunded for technology. However it is not enough to simply throw more scarce education dollars into the voracious maw of computer hardware and related technologies and assume that all will be well. There is growing evidence that the instructional technology base currently installed in many classrooms is being underutilized. Simply providing teachers with additional computer technology is insufficient to ensure that it will be effectively implemented as an integral portion of the daily curriculum.

Although much energy is being directed towards the restructuring of schools, technology has not,as yet, been viewed as a key element in the success of these efforts. The advantages of computer technologies for enhancing instructional and learning environments are demonstratively obvious. Why are they not wholeheartedly adopted by teachers and administrators? What are the obstacles which prevent teachers from incorporating technology into the instructional arena. There are basically two categories of obstacles: limited access and ease-of-use.

Limited Access

Increasing amounts of computer technology are being placed into schools. However, in many instances this technology is still not directly accessible to the classroom teacher. Frequently the computer technology has been concentrated in limited numbers in computer labs and media centers. Teachers/classes are scheduled in the lab only two or three times a week. This pull-out model makes it difficult for teachers to integrate the classroom curriculum with the computer lab curriculum

Even when computer systems are distributed into the classroom teachers may find it difficult to gain access to the information stored on the computer. When an electronic curriculum is supported by some type of instructional management system, the system may often rigidly control how the curriculum may be used or accessed. Not only is instructional information often difficult to access on the computer, but also administrative information. Computers are capable of storing an incredible amount of data on student backgrounds and needs which is of legitimate use to the teacher. But that information does a classroom teacher little good when stored on a computer accessible only to the principal or on the district mainframe. If there is no management system the teacher is left often with even less information about how to use and integrate a wide variety of software packages from different publishers.

Ease of Use

Teachers are heavily burdened with the constraints of managing the instructional environment: student evaluation and assessment, matching individual student needs with content, sequencing instruction, recording keeping, and reporting student progress. All too often the addition of computer-based technology is perceived as one element too many in an already overtaxed situation. Teachers frequently feel they simply do not have the time or energy to master and integrate an instructional device which is perceived as complex and, all too often, as only marginally relevant to the existing curriculum. For those teachers who do make the effort, the implementation of computer-based technology ranges from providing student free-time use of software which in some way supplements the content being taught to the systematic use of computer-based tools which enhance the delivery and assimilation of instruction.

Stand alone software may support instruction of discrete objectives but is not intended to comprehensively support the entire curriculum of a specific content area let alone cross-curricular goals and objectives. Rarely does stand alone software provide the flexibility to customize the instruction based on individual needs or even monitor and/or report student progress. Integrated learning systems are designed to accomplish the above not just for one student but for an entire school. However, the down-side of this power is that the user interface for instructional management is frequently perceived as intimidatingly complex.

Most computer-based instructional management systems are outgrowths of older, larger computer systems. They were designed to be used by computer specialists, not classroom teachers. Often these systems are entirely text based and require extensive familiarity with computer operating systems and database systems. As a result, they often make the job of the classroom teacher harder, not easier.

The Renaissance Project

Beginning in late 1989, Jostens Learning Corporation undertook the development of a new generation of information management systems for public schools. Code-named the Renaissance Project, the development effort has been focussed on addressing a variety of problems which include limited access and ease of use. Efforts were at times supported and constrained by the need to develop a final product that was technically viable and economically feasible for schools today. At times, some theoretical avenues were not fully explored in order to concentrate on the

sometimes more immediate and pragmatic problem of "getting the product out the door." Nonetheless, there are some empirically derived insights which may be of use to others trying to address these same issues.

Renaissance System Requirements

The development of the Renaissance Information Management System (RIMS) began with an attempt to clearly define what barriers currently existed to using computer systems in public schools. Surveys were conducted in dozens of school systems across the United States. The surveys included questionnaires from classroom teachers who used computers frequently, teachers who only occasionally used computers, teachers who had never touched a computer, school administrators, teacher's aides, parents, and community volunteers. Jostens Learning education service representatives who train school staffs on using the company's integrated learning systems were included in the surveys. One of the more useful techniques for getting information on the issues of implementing technology was the analysis of the logs of Jostens Help Line staff.

Yet another source of information and guidance was a National Advisory Council made up of expert classroom teachers, administrators, and computer specialists from across the nation. This council initially met frequently to help define the requirements for the system, and then regularly for the next two years to constantly monitor and review the development of the system itself.

As a result of this extensive data collection, several hundred requirements were defined for the new system. Classroom teachers identified access to information and professional resources as amongst the most critical attributes. Teachers wanted access to other staff members, outside experts, curriculum information, student records, collaborative learning tools, electronic references and productivity tools. They also wanted more control over curriculum delivery and student assessment. At the same time that educators were expressing the need for more control over the system they also requested a system far more sensitive and adaptive to individual student needs and conditions--an "intelligent" instructional delivery system.

RIMS is an information management user-interface for an integrated learning system which graphically portrays the school environment and borders on that of virtual reality. The intent is to provide users with tools --familiar in appearance--which easily allow for the customizing of instructional sequences and the monitoring of student progress.

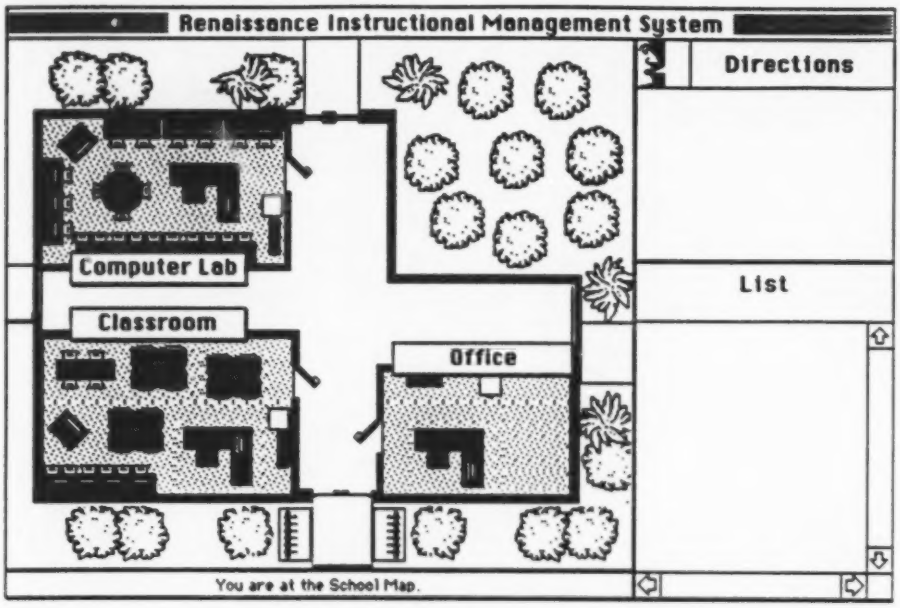
In trying to address these requirements the classic Catch 22 of product development immediately became apparent--how to add more functionality while at the same time making the system easier to use. Clearly a new type of interface system was needed. A variety of graphic interface systems (GUI) including both the Macintosh, Windows, and Next operating systems were investigated. While all of these constituted an significant improvement over previous text-based operating environments, the volume of information in the system soon became overwhelming using standard graphical interfaces so other more non-conventional interface technologies were explored.

RIMS Interface

A new technique in interface design is the creation of three dimensional, all encompassing representations of physical space. Interfaces such as these,which grew out of CAD/CAM technology, surround the user with a metaphorical space that the user can navigate through in order to act in a fashion that fits the way they would act if that space were real. This type of graphic environment is often referred to as a "virtual reality" or "cyberspace". The initial RIMS concept was to create a functional environment that would encompass an entire school building, in other words a "virtual school".

However to do so required an incredible amount of raw computer processing power and vastly more data space than would be available on affordable school computers . A simpler frame-based model was selected as a viable alternative (See Figure 1). This simplified model which employed extensive use of hypertext still allowed for the communication and representation of information in innovative ways but did not require the sheer horsepower of a complete virtual reality system.

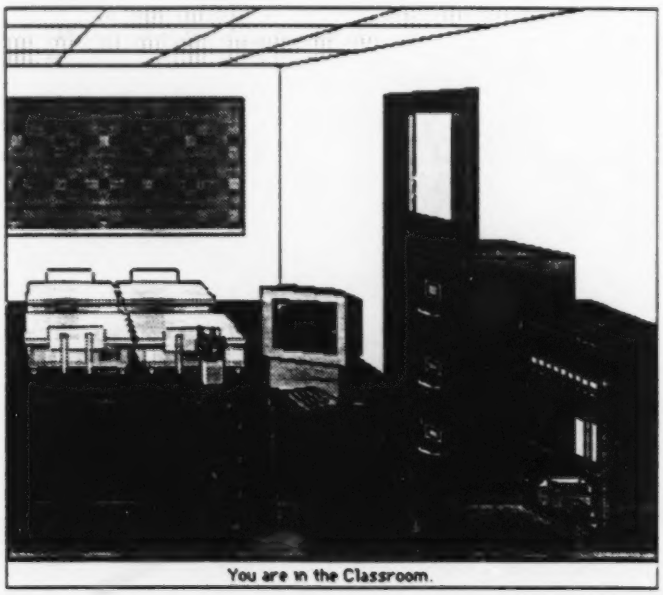
Figure 1 The Renaissance School Map



A description of each of RIMS features would be prohibitively lengthy and so only two modules which are especially relevant to enhancing teacher utilization--Student Records and the Learning Path Editor--are described herein.

Entrance to the world of RIMS begins by selecting a room from the school map (See Figure 2).

Figure 2 The Renaissance Classroom

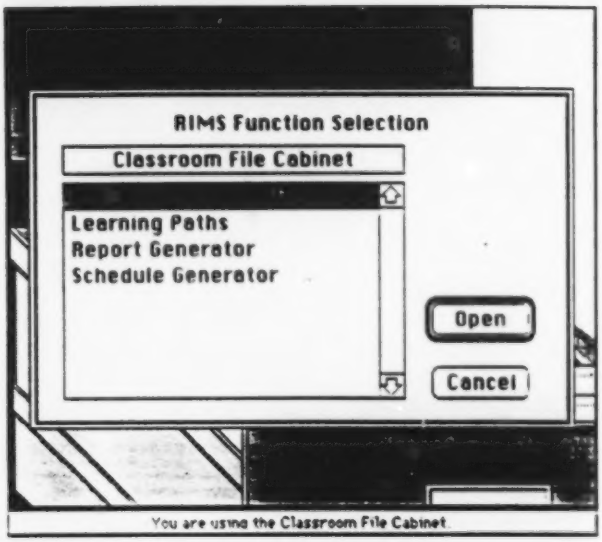


The classroom display provides access to a number of information management and productivity tools: The file cabinet is the doorway to a variety of classroom management features among them student records and the sequencing of instruction. There are three basic tasks to be accomplished. Students must be entered into the system, instructional sequences must be defined, and students must be assigned to specific learning paths. It is not necessary to accomplish these tasks in the order given.

Student Records

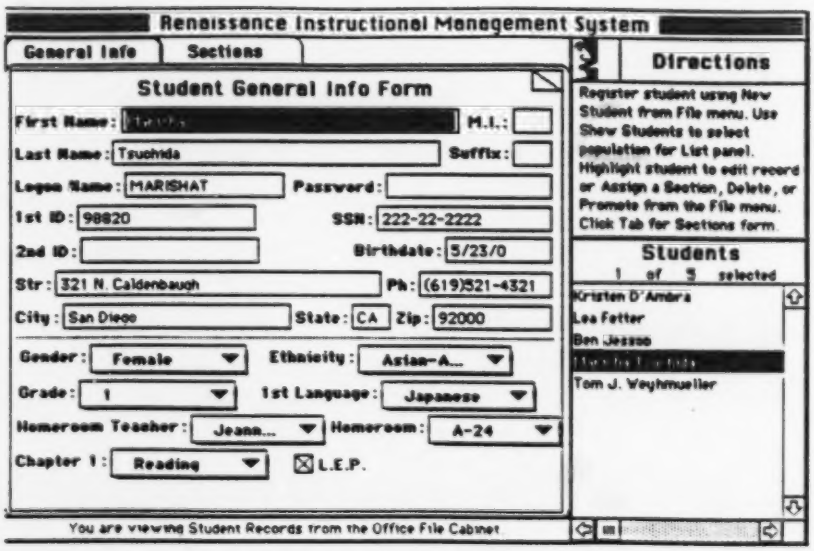
Student records utilizes a graphic metaphor of tabbed file folders to make working with student information more intuitive. The folders are accessible by clicking on the file cabinet which results in a pop-up menu of record selections (see Figure 3).

Figure 3 Access to student records from the file cabinet



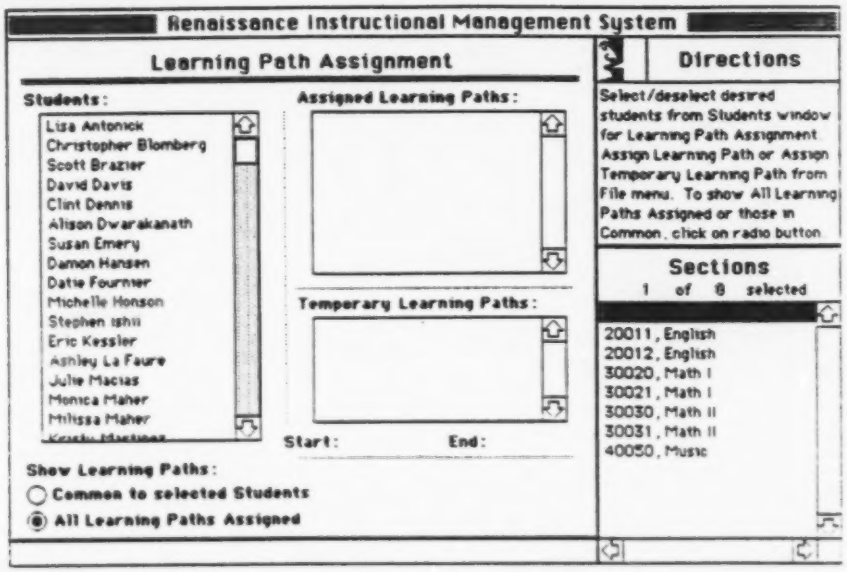
Access to student records is controlled through special security options defined under the School Setup Module. Data on student achievement is also stored in Student Records. Teachers or administrators with the proper file privileges will be able to add, delete, or modify student records using simple pull-down menus or graphic buttons (See Figure 4).

Figure 4 Student Records



After students have been entered into the system, they must be assigned to specific instructional sequences or Learning Paths (See Figure 5). Students can be assigned to Learning Paths in entire sections, as individuals, or even on a temporary basis.

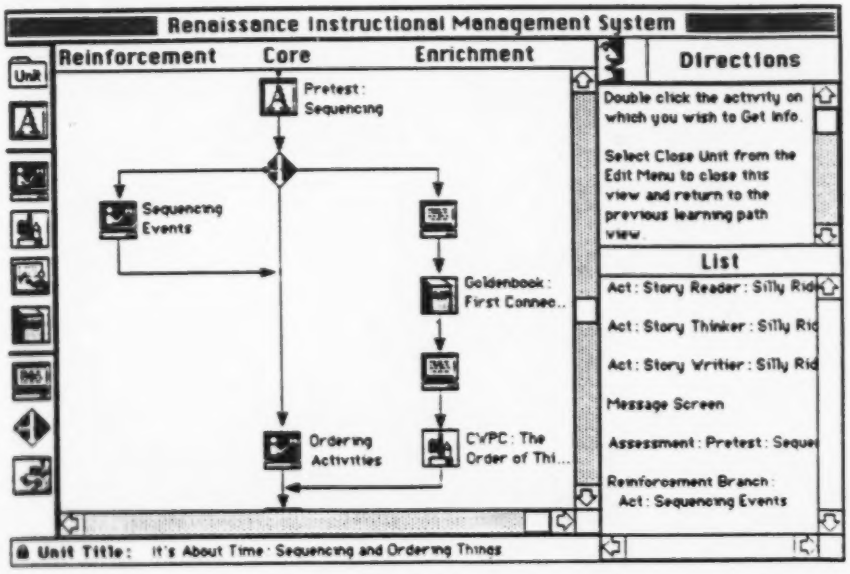
Figure 5 Learning Path assignment



The Learning Path Editor

In an effort to provide educators with the power to customize instruction and student assessments a tool called the Learning Path Editor (LPE) was created. RIMS is designed to ensure that students have the prerequisite knowledge needed before being allowed to enter a unit of instruction. Teachers also wanted the system to "automatically" branch to remediation or to enrichment activities whenever appropriate (See Figure 6). The RIMS system provides a high degree of sophistication in directing the activities of students while also providing educators the power to override the system at any time.

Figure 6 Renaissance Learning Path


Renaissance Instructional Management System
Reinforcement
Core
Enrichment
Pretest: Sequencing
Sequencing Events
Goldenbook: First Connec...
Ordering Activities
CVPC: The Order of Thi...
Directions
Double click the activity on which you wish to Get Info.
Select Close Unit from the Edit Menu to close this view and return to the previous learning path view.
List
Act: Story Reader: Silly Rid
Act: Story Thinker: Silly Ric
Act: Story Writier: Silly Rid
Message Screen
Assessment: Pretest: Seque
Reinforcement Branch:
Act: Sequencing Events
Unit Title: It's About Time: Sequencing and Ordering Things

The LPE allows the customer to easily construct branched instructional sequences and assessments using an object oriented graphic system. Required elements (assessment, core instruction, remediation, enrichment, reference tools) need only be clicked and dragged into place from the menu bar to define an instructional sequence. As the LPE was developed it became apparent that the sheer volume of materials available to the user was overwhelming. There were literally thousands of lessons, tools, and tool templates available to any teacher who wished to create a instructional sequence. It would be impossible for any teacher to become readily familiar with such a large body of material. An underlying hypertext system was created which allowed teachers to browse through descriptions of any material for potential inclusion into the electronic curriculum.

Figure 7 Learning Path unit level

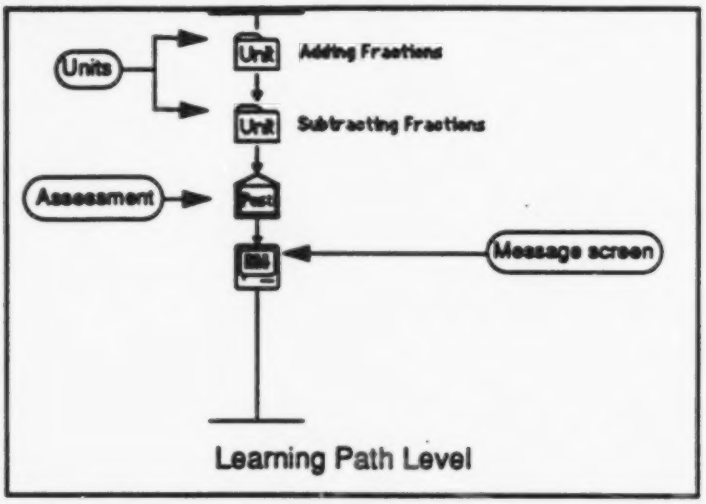
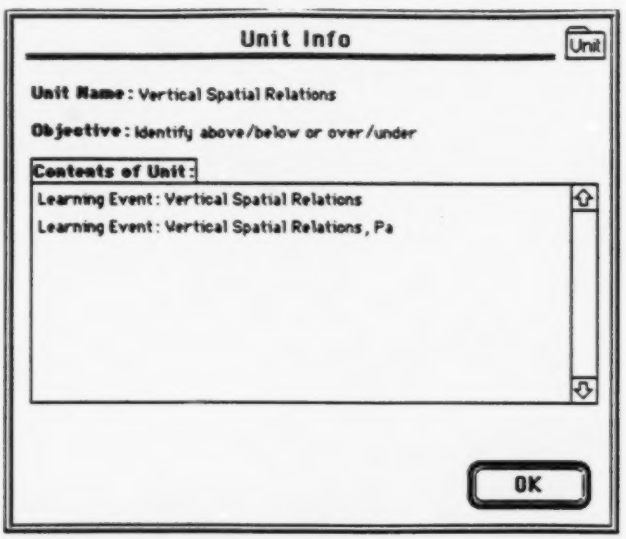


Figure 7 is a sample screen display of an instructional sequence at the unit level . Descriptions of each curriculum component are provided at the click of the mouse. Clicking on the unit icon and selecting Get Info provides the teaches with detailed information about the instructional content of that specific unit (See Figure 8). The general objective is listed as are each of the lessons provided in the unit. Clicking on the Learning Event produces a more detailed listing of the specific objectives for the lesson. As a navigational feature the source icon is depicted in the upper right corner.

Figure 8 Unit level information



Conclusion

Jostens Learning has assessed the needs of educators and has developed a user interface designed to empower the management of information and technology access in the classroom The pragmatic limits and implications of providing such interfaces for educators are being explored in hopes that computer-based instructional technologies will be more readily employed in schools to provide optimal instructional environments for students. The next step is to evaluate the effectiveness of these new tools in meeting the needs of educational information management for the classroom teacher, students, administrators, and parents.